Atmospheric rivers and their contribution to a 40-year Lagrangian "climatology"

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The transport of moisture from the tropics to mid-latitudes is not continuous and uniform, but rather intermittent. More than 90% of poleward water vapor is transported by narrow and elongated structures (longer than 2000 km and narrower than 1000 km). These structures, referred to as Atmospheric Rivers (ARs), are a key process for the latent heat redistribution and atmospheric mixing. They are responsible for extreme precipitation and flood events as they approach coastal areas.

Based on an integrated water vapor flux obtained from the ERA-Interim database, AR events have been clearly identified with attracting Lagrangian Coherent Structures (LCS) (Chaos **25**, 063105 (2015)). From a Lagrangian point of view, the attracting LCS accumulates water vapor in front of the pattern moving towards the east.

Given that ARs over the Atlantic and Pacific Ocean appear as coherent filaments of water vapor with a persistence time of several days up to a week and they occur periodically, we will address their contribution to the atmospheric mixing in the troposphere. To that end, a 40-year Lagrangian "climatology" based on the calculation of Finite-Time Lyapunov Exponents (FTLE) has been calculated. Different geophysical drivers as ENSO and ARs were identified in the FTLE climatology. Our results suggest that ARs contribution to the atmospheric mixing ranges from 15 to 25%.